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Abstract. Based on the non-abelian effective action for D1-branes, a new action for matrix string theory in non-trivial backgrounds is proposed. Once the background fields are included, new interactions bring the possibility of non-commutative solutions i.e. The Myers effect for "string bits" .

String bits and the Myers effect

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I MATRIX STRINGS

Matrix string theory [1–3] is one of the most interesting outcomes of the different dualities in M-theory. Perhaps a simple way to define it is by looking at Matrix theory [4] with an extra compactified dimension. For example, following Dijkgraaf et. al. [1], if we consider M-theory on a torus of radii A and B, by first reducing on A and then making an infinite boost on B we get type IIA string theory on the discrete light cone (DLC) with D0-brane particles. If, on the other hand, we reduce on B first, boost and then consider t-duality on A, we get (1+1) super Yang-Mills (SYM) theory with fundamental string charge on the world-volume i.e. the low energy theory of D1-branes. One finds therefore, that Matrix string theory is a non-perturbative definition of string theory built in terms of a two dimensional SYM theory and a collection of scalar fields in the adjoint representation of the gauge group (see the original papers for an extended discussion of this derivation). Although we have discussed only type IIA string theory, there are other constructions similar to the one sketched before, where the other four superstring theories are written in terms of two dimensional SYM theory[1].

The Matrix string theory conjecture was originally formulated on flat backgrounds. Lately, using some techniques developed by Taylor and Raamsdonk [5] a generalization for closed strings on non-trivial weak backgrounds has appeared [6]. This talk is based on the paper [7], a further generalization of the original Matrix string theory to non-trivial weak backgrounds based on the non-abelian D1-brane action proposed by Myers.

In [6,7], the possibility of non-abelian configurations of fundamental strings was pointed out. In particular, the appearance of a Myers-like effect was computed explicitly (By now the Myers effect [8] is a well known phenomenon where N D-branes adopt a non-abelian configuration that can be understood as a higher dimensional abelian D-brane). These configurations come about as the result of new interaction terms that appear in the non-abelian effective actions.

The appearance of strings describing D-branes is not new. There are computations of Dp-branes collapsing into fundamental strings [9] and fundamental strings blowing up into Dp-branes [10], always in terms of the abelian Born-Infeld actions of the corresponding D-branes. What is new in the matrix string formulation is that we have a formalism in which a two-dimensional action naturally includes matrix degrees of freedom representing the "string